

Infectious Disease

Overview

Infectious disease mortality rates in the U.S. decreased throughout the first eight decades of the 20th century, due primarily to vaccinations and improvements in living conditions, sanitation, and medical care.¹ In recent decades we have seen the influence of new risk factors affecting the incidence of infectious disease including decreases in population wide vaccination coverage, late diagnosis of communicable diseases such as HIV/AIDS and Hepatitis C, and the emergence of multidrug resistant strains of pathogens.

Health Equity Highlight: New Mainers

Tuberculosis

Tuberculosis (TB) is a mycobacterial disease caused by *Mycobacterium tuberculosis*. The disease is spread through the air by droplets when a person infectious with TB coughs, talks, sings, or sneezes. TB is only infectious when the disease is within the lungs or larynx. Latent tuberculosis infections (LTBI) are inactive and require medication to prevent active infectious TB from developing.

Maine CDC TB Control Program monitors the incidence of TB through mandatory reporting and assists with monitoring and managing both TB and LTBI cases. In 2010 there were 8 cases of TB and 420 cases of LTBI reported to Maine CDC. Eighty-eight percent of the TB cases and 80% of LTBI cases were diagnosed among foreign born persons.⁶

Maine CDC Public Health Nursing provides assessment of immunization and current health status, communicable disease history and referral for medical and dental care for New Mainers. Screening for TB is part of this assessment and results in early identification and management of disease in this population.⁷

Approximately 42,000 adults and 300 children in the U.S. die each year from vaccine-preventable diseases.² In addition, healthcare associated infections (HAI) are among the top ten causes of death in the U.S., resulting in approximately 99,000 deaths annually at a cost of \$33 billion.³ Advances in laboratory diagnostics allowing for earlier disease recognition has offered opportunities to impact the lives of those under treatment and to institute earlier disease control responses for initiation of prophylaxis to close contacts.⁴

Infectious diseases seen in Maine include those which circulate commonly in the United States (of which some diseases are vaccine preventable and some are not). Infectious diseases may also be imported into Maine from residents that travel (to other regions of the US as well as the world), from visitors to the state, and from recently arriving foreign-born refugees, secondary migrants, asylum seekers, asylees, non-refugee immigrants (includes adoptees) and parolees.⁵

The Public Health Response

Infectious disease morbidity and mortality can be decreased through surveillance systems and registries that help to identify cases of disease early in the course of disease and to track prevention efforts such as immunization. Reporting of cases of notifiable infectious diseases in Maine is mandatory in Maine. Maine CDC conducts public health surveillance and responds to prevent additional transmission of communicable diseases.

Education targeted to both the public and healthcare providers is essential to update and remind individuals and professionals on recent prevention guidelines. Educational outreach to health care providers and to populations at risk for specific diseases, such as HIV⁸ and Hepatitis C⁹ can also lead to increased screening and increased case finding. Earlier and increased knowledge of

disease status can provide opportunities for disease prevention through treatment and for education about behaviors to reduce the risk of transmission to others.¹⁰ Educational outreach to the public and provider on the importance of immunization is essential to support the effort to increase vaccination coverage among Maine residents.¹¹

Vaccination requirements for entry into childcare, school, college, and other post-high school educational institutions ensure high levels of protection in these facilities and help achieve high levels of vaccination coverage in the community. Despite vaccination requirements for school admission, there are many students in Maine who are not vaccinated and are susceptible to disease. Recently, efforts to increase immunization coverage among Maine children have led to a private-public partnership for a universal program to supply vaccines free of charge to children. The program supplies all recommended childhood vaccines free of charge to healthcare providers in the State. Universal vaccine supply for children in Maine will reduce the financial barriers for parents and enable access to all recommended childhood vaccines with no or low out-of-pocket costs. In addition to universal vaccine supply, Maine CDC conducts outreach to healthcare providers and the community on the importance of vaccination and encourages healthcare providers to utilize

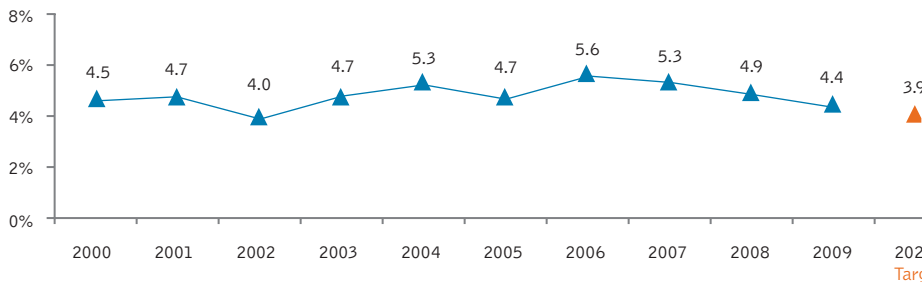
ImmPact2, the State’s web-based immunization registry, to record and track the vaccination status of children. These activities also require strong partnerships with health care providers, professional organizations, advocates and community-based advisory boards.

HM2020 Objectives

1. Increase the percent of persons with Chronic Hepatitis C infection that know their serostatus

Hepatitis C virus (HCV) infection is the most common chronic bloodborne infection in the United States with an estimated 3.2 million persons infected. HCV is most often transmitted through the sharing of needles in the use of injection drugs accounting for 60% of HCV transmission in the U.S. To a lesser extent transmission occurs through exposures in health-care settings as a result of a breach in infection control practices. Sexual transmission of HCV is possible but rare. Blood transfusion, which accounted for a substantial proportion of HCV infections acquired greater than 10 years ago, rarely accounts for recently acquired infections, with no cases detected through the U.S. CDC’s sentinel counties viral hepatitis surveillance system since 1994. There is no vaccine for hepatitis C and many people who have hepatitis C infection are unaware of how they contracted it. Without testing for infection and knowledge of serostatus, many chronically infected persons are unaware of

Percentage of People with Hepatitis C Who Know Their Sero-status, Maine 2001-2010



Data source: numerator: Maine CDC Notifiable Electronic Disease Surveillance System; denominator: derived from National Health and Nutrition Examination Survey

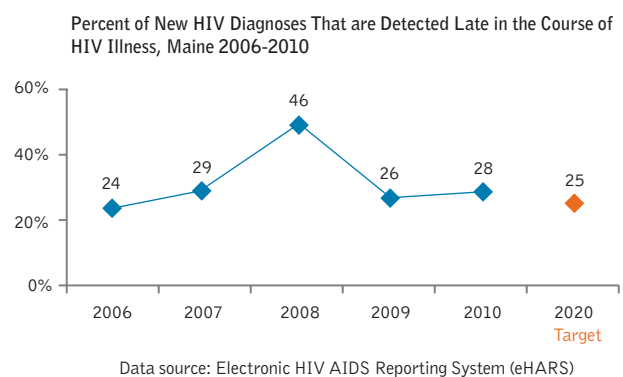
their infection until symptoms of advanced liver disease appear. This lack of awareness means chronically infected persons are missing critical opportunities to access care and treatment which can help to eliminate the virus and reduce damage to the liver. HCV is one of the leading causes for liver transplants in the United States.

During 2001-2010 an average of approximately 1,250 cases of chronic HCV infection were reported to the Maine CDC each year, with over 16,000 reports made to Maine CDC since chronic hepatitis C reporting began in 1997. These reported cases are an underestimate of the true burden of disease in the state due to unrecognized infections and underreporting of diagnosed HCV infections. By applying national prevalence estimates to the Maine population, it can be roughly estimated that approximately 21,000-26,000 Mainers are living with chronic HCV infection.

2. Reduce the percent of new HIV diagnoses that are detected late in the course of HIV illness

Human immunodeficiency virus (HIV) is the virus that can lead to acquired immune deficiency syndrome, or AIDS. Persons living with HIV may appear and feel healthy for several years. Many persons with HIV, including those who feel healthy, can benefit greatly from current medications used to treat HIV infection. These medications can limit or slow down the destruction of the immune system, improve the health of persons living with HIV, and may reduce their ability to transmit HIV. AIDS is the late stage of HIV infection, when a person's immune system is severely damaged and has difficulty fighting diseases and certain cancers. The U.S. CDC recommends that everyone between the ages of 13 and 64 years should be tested for HIV at least once. Individuals at increased risk for HIV should be tested for HIV at least once a year.

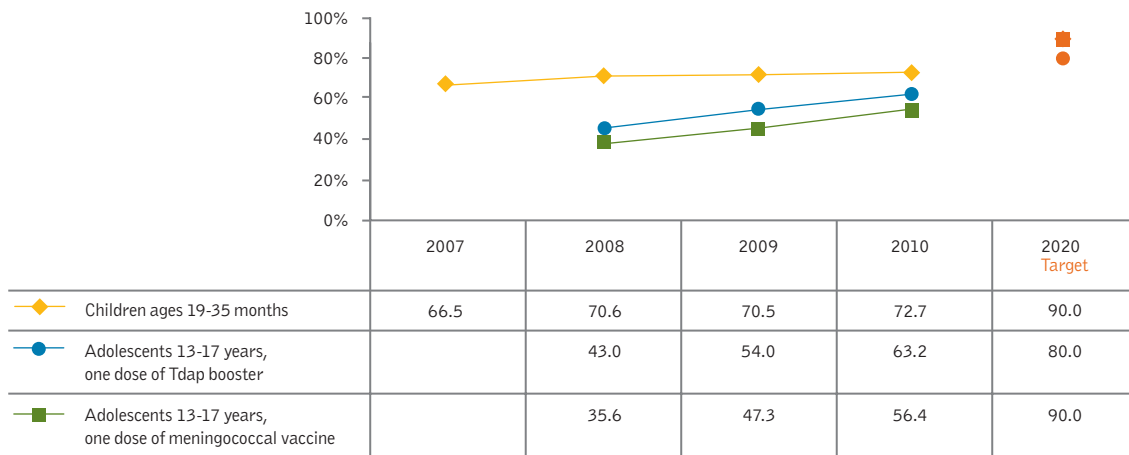
In 2007 the percent of persons who received a late HIV diagnosis reported in the US was 32%. In Maine, the percent of persons with late HIV diagnosis peaked in 2008 at 46 percent. In other years roughly 25-30% of reported HIV cases received a late diagnosis. The Healthy Maine 2020 goal is to decrease the percent of late diagnoses among HIV positive persons in Maine by 10%.



3. Increase routine vaccination coverage levels for children and adolescents

Immunization is an effective measure for preventing many diseases of childhood. Unvaccinated children and adolescents are susceptible to diseases which are accompanied by severe illness, complications, and death. In the pre-vaccine era many children died from diseases such as whooping cough, measles, and polio. Immunizing individuals helps to prevent disease and protect the health of our community, especially those people who cannot be vaccinated. People who are not immunized include those who are too young to be vaccinated (e.g., children less than a year old cannot receive the measles vaccine but can be infected by the measles virus), those who cannot be vaccinated for medical reasons (e.g., children with allergies to the vaccine), and those who cannot make an adequate response to vaccination (persons with weakened immune systems due to other disease processes).

Percent of Children Routinely Vaccinated, by Vaccination Type and Age Group, Maine 2007-2010



Data Source: National Immunization Survey and National Immunization Survey – Teen.

Increasing the immunization coverage of children and adolescents would effectively reduce the burden of vaccine preventable diseases in Maine. High vaccination coverage in the population prevents disease outbreaks and slows down transmission when outbreaks do occur.

Maine coverage rates for childhood vaccinations have been increasing, but the national rates have increased faster than those of Maine. The trends for adolescents are similar. Maine's coverage of the adolescent population, ages 13 to 17 years, with one dose of Tdap and one dose of meningococcal vaccine has been increasing in the past few years.

3a. Increase routine vaccination coverage levels for children ages 19 to 35 months.

Current immunizations recommendations include the following doses of vaccines for children by the time they are three years of age: four doses of diphtheria, tetanus and pertussis (DTaP); three doses of Polio; one dose of Measles, Mumps and Rubella (MMR); three doses of Haemophilus influenza b (Hib); three doses of Hepatitis B; one dose of Varicella; and four doses of Pneumococcal conjugate (PCV7).

In Maine routine vaccination* coverage levels for children ages 19 to 35 months have increased modestly from 2008-2010, from 70.6 to 72.2 percent. The HM2020 objective is to increase this coverage to 90 percent.

* For 2008-2010 the 4:3:1:0:3:1:4 series is used.

A shortage of Hib vaccine in 2008 resulted in a change in the US CDC measure to avoid artificially low rates in some states, including Maine. It is anticipated that after a few more years, Maine will return to measuring completion of the 4:3:1:3:3:1:4 series

3b. Increase routine Tdap vaccination coverage levels for adolescents ages 13 to 17 years

The adolescent vaccination schedule consists of both new vaccinations recommended specifically during adolescence and vaccinations recommended during early childhood that might have been missed. Optimally, adolescent vaccines should be delivered during the age 11-12 year health care visit. Vaccinations not received at that time should be administered at the earliest opportunity. Maintaining coverage in this population is challenging because adolescents make few preventive health-care visits and might not visit

their primary care provider routinely.¹² Each health-care encounter becomes an opportunity to review vaccination records and administer recommended vaccinations.

Recommendations for teens include a booster shot that protects against tetanus, diphtheria and pertussis (Tdap) starting in the pre-teens at age 11 or 12. Older teens who have not had the Tdap booster should also receive this vaccine. In Maine the rates of coverage for Tdap vaccine in this age group have increased from 2008-2010 from 43 to 63.2 percent.

3c. Increase routine meningococcal vaccination coverage levels for adolescents ages 13 to 17 years.

Meningococcal vaccine protects against four types of meningococcal disease, including two of the three types most common in the United States. Meningococcal meningitis a form of bacterial meningitis, a severe illness affecting the lining of the brain and spinal cord, characterized by a

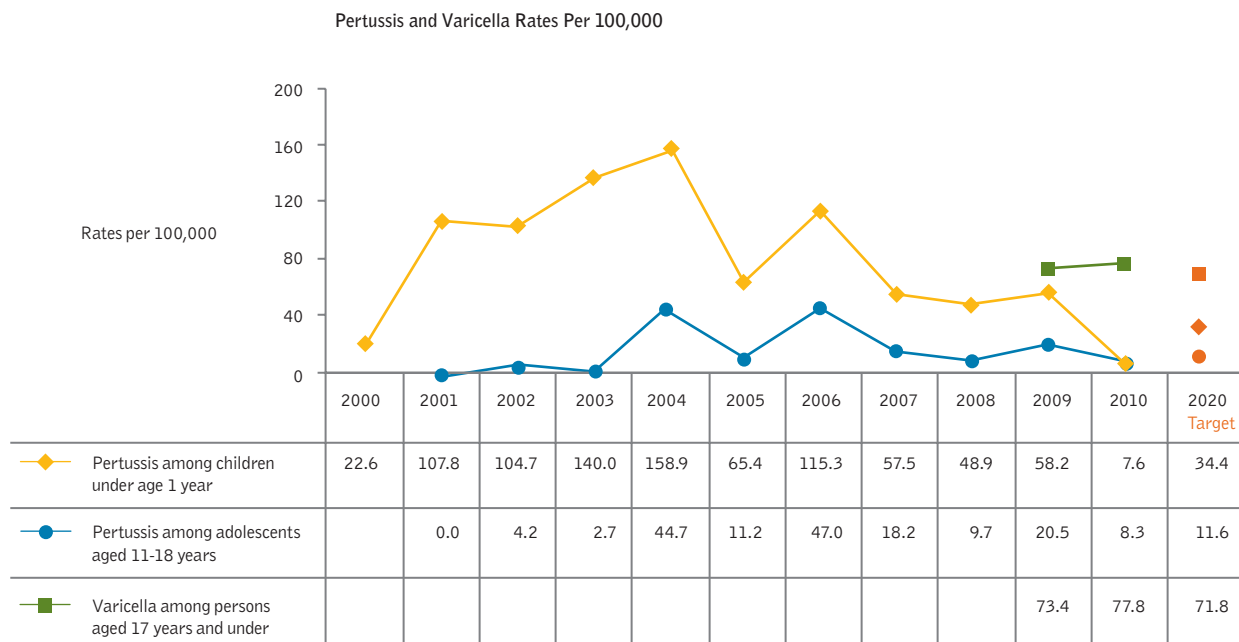
sudden onset of fever, headache, and stiff neck. Teenagers and young adults 16 through 21 years old are at increased risk of getting meningococcal disease. Persons in dormitory settings such as college students are also at increased risk of meningococcal disease. Meningococcal conjugate vaccine is routinely recommended for all persons 11 through 18 year olds. In Maine the rates of coverage for meningococcal vaccine in this age group have increased from 2008-2010 from 35.6 to 56.4 percent.

4. Reduce, eliminate, or maintain elimination of cases of vaccine-preventable diseases (focus on Pertussis and Varicella)

4a. Reduce pertussis among children under age 1 year

4b. Reduce pertussis among adolescents aged 11-18 years

Pertussis (whooping cough) is a bacterial infection of the respiratory tract caused by *Bordetella pertussis*. Symptoms include an irritating cough



National Electronic Disease Surveillance System (NEDSS)

lasting at least 2 weeks with paroxysmal cough, whoop, and vomiting after coughing spasms. Pertussis can cause serious and sometimes life-threatening complications in infants and young children, especially those who are not fully vaccinated. More than half of infants younger than 1 year of age who are infected with pertussis must be hospitalized.

The best way to prevent pertussis among infants, children, teens, and adults is to get vaccinated. In the United States, the recommended pertussis vaccine for infants and children is called DTaP. This is a combination vaccine that protects against three diseases: diphtheria, tetanus and pertussis. For maximum protection against pertussis, children need five DTaP shots, given at 2, 4, and 6 months of age, between 15-18 months of age and between 4-6 years of age, before the child enters school. A booster shot that protects against tetanus, diphtheria and pertussis (Tdap) is available for pre-teens at age 11 or 12. Teens and adults (including pregnant women preferably after 20 weeks gestation) who have not had the Tdap vaccine should also receive a booster. High pertussis vaccination rates are associated with lower numbers of pertussis cases in the community.¹³

In 2011, the Maine CDC identified an increase in the pertussis rate when compared to 2010. The cases ranged in age from 1 month to 79 years.¹⁴ Clusters of pertussis cases occurred in schools, camps, sport teams and workplaces. The adolescent age group consistently represents more than a quarter of all Maine's cases.

4c. Reduce varicella among persons aged 17 years of age and under

Varicella (chickenpox) is a highly contagious viral disease of which humans are the only source of infection. It causes a blister-like rash, itching, tiredness, and fever. Varicella spreads easily from

infected people to others who have never had chickenpox and never received the chickenpox vaccine. Chickenpox can be serious, especially in babies, adults, and people with weakened immune systems. Adolescents and adults are more at risk for severe disease which could include pneumonia, bacterial infection of the skin and swelling of the brain. Vaccination is the best way to prevent chickenpox and results in less severe illness and less absenteeism in school children.

In Maine, varicella cases are primarily reported from schools. Historically varicella reporting has been aggregate in nature and case-based reporting that includes the age of the individual has become available over the past two years. Improvements in case-based varicella reporting will be implemented in 2012. Establishing accurate estimates for cases of varicella is challenging because it is diagnosed clinically (by providers based on signs and symptoms) and is not confirmed and reported by laboratories. In 2010 there were 247 cases of varicella reported to Maine CDC, for a rate of 77.8 cases per 100,000 children ages 0-17.¹⁴

As with pertussis, the best way to prevent varicella is to get the varicella vaccine. All healthy children 12 months through 12 years of age should have two doses of chickenpox vaccine, administered at least three months apart. Children who have evidence of immunity to varicella do not need the vaccine. People 13 years of age and older who do not have evidence of immunity should get two doses of the vaccine four to eight weeks apart. In Maine, vaccination with one dose of varicella vaccine has been a mandatory requirement for school entry since 2003.

5. Reduce invasive healthcare-associated methicillin-resistant *Staphylococcus aureus* (MRSA) infections

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a type of staph bacteria that is

resistant to certain, more common antibiotics such as methicillin, penicillin, and amoxicillin. In the community, most MRSA infections are skin infections. More severe or potentially life-threatening invasive MRSA infections occur most frequently among patients in healthcare settings. Invasive MRSA infection occurs when the bacteria infects a normally sterile site (such as blood or cerebral spinal fluid). Persons with weakened immune systems, the elderly, and those with invasive medical devices are at increased risk of invasive MRSA infections.¹⁵ A MRSA bloodstream infection has a mortality rate that is twice that of a methicillin sensitive *Staphylococcus aureus* (MSSA) bacteremia.

In 2010, encouraging results from a U.S. CDC study showed that invasive (life-threatening) MRSA infections in healthcare settings are declining, demonstrating that these rates can be impacted by prevention programs. Invasive MRSA infections reported from hospitals declined 28% from 2005 through 2008. Data from the National Healthcare Safety Network (NHSN) showed a decrease of nearly 50% from 1997 to 2007 in MRSA bloodstream infections occurring in hospitalized patients.

The Maine CDC HAI program works closely with an advisory group, the Maine Infection Prevention Collaborative, to develop strategies to decrease MRSA infections and to measure the rates and cases of MRSA occurring in Maine's hospitals. In order to measure the progress made, it is necessary that all hospitals report healthcare associated infections using uniform definitions through the National Healthcare Safety Network (NHSN). In

the spring of 2011, the Maine Legislature passed a bill which required hospitals to report healthcare associated infections of Methicillin Resistant *Staphylococcus aureus* (HAI-MRSA) using the NHSN surveillance system. Data entry for this measure began in January 2011 and as of October, 2011, Maine CDC is able to review HAI-MRSA data from Maine hospitals. Understanding the burden of invasive MRSA infections in the state is essential for developing and implementing effective prevention programs.¹⁵ This process requires that the data submitted be validated before public dissemination. Validation methods are still under development, and therefore the data is not yet available.

Methodology:

1. (Developmental) Increase the percent of persons with Chronic Hepatitis C infection that know their serostatus

Measure: Percent of persons with Chronic Hepatitis C infection reported to Maine CDC of those estimated to have Chronic Hepatitis C infection in Maine.

Numerator: Number of Chronic Hepatitis C cases reported yearly to Maine CDC.

Denominator: Estimated Number of Persons with Chronic Hepatitis C in Maine.

Target setting method: 10% decrease from 2010, maintaining current decreases.

Other notes: the denominator of this objectives is derived by creating a state-based estimate from a national estimate of percent of persons with Chronic Hepatitis C infection, from the CDC National Health and Nutrition Examination Survey (NHANES), using the upper range of this estimate.

2. (Developmental) Reduce the percent of new HIV diagnoses that are detected late in the course of HIV illness.

Measure: Percent of newly reported cases with late HIV diagnosis

Numerator: Number of newly reported cases with CD4 cell count below 200 cells/mm³ within one year of initial HIV positive status reported to MeCDC

Denominator: Number of new cases of HIV reported to MeCDC per year

Target setting method: 10% decrease from 2010.

Other notes: Data currently available for 2006-2010.

3. Increase routine vaccination coverage levels for children and adolescents

SUB-OBJECTIVES:

3a. Increase routine vaccination coverage levels for children ages 19-35 months.

Measure: Percentage of children ages 19-35 months vaccinated according to the US CDC recommendations.

Numerator and Denominator: calculated by the U.S. CDC, National Immunization Survey.

Target setting method: 90% coverage (HP2020 target).

Other notes: The vaccinations reported before 2008 are the 4:3:1:3:3:1:4 series but for 2008-2010 the 4:3:1:0:3:1:4 series is used. A shortage in Hib vaccine in 2008 resulted in a change in the US CDC measure to avoid artificially low rates in some states, including Maine. It is anticipated that after a few more years, Maine will return to measuring completion of the 4:3:1:3:3:1:4 series. The series 4:3:1:3:3:1:4 indicates that each child has had these vaccines: 4 doses of DTaP, 3 doses of Polio, 1 dose of Measles, Mumps and Rubella, 3 doses of Hib, 3 doses of Hepatitis B, 1 dose of Varicella, and 4 doses of Pneumococcal conjugate (PCV7). For 2008-2010, the 4:3:1:0:3:1:4 series, including the same vaccinations except for no doses of Hib are included.

3b. Increase routine Tdap vaccination coverage levels for adolescents ages 13 to 17 years

Measure: Percentage of adolescents ages 13-17 years vaccinated with one dose of Tdap booster.

Numerator and Denominator: calculated by the U.S. CDC, National Immunization Survey.

Target setting method: 80% coverage (HP2020 target).

3c. Increase routine meningococcal vaccination coverage levels for adolescents ages 13 to 17 years.

Measure: Percentage of adolescents ages 13-17 years one dose of meningococcal conjugate vaccine.

Numerator and Denominator: calculated by the U.S. CDC, National Immunization Survey.

Target setting method: 90% coverage (HP2020 target).

4. Reduce, eliminate, or maintain elimination of cases of vaccine-preventable diseases (focus on per-tussis and varicella)

SUB-OBJECTIVES:

4a. Reduce pertussis among children under age 1 year

Measure: Annual rate of confirmed + probable cases, including outbreak settings, reported among children under age 1 year.

Numerator: Count of all confirmed and probable cases of pertussis among children under age 1 year.

Denominator: Age specific population estimates from the US Census.

Target setting method: 10% decrease

Other notes: NEDSS data are available for pertussis cases since 2001.

4b. Reduce pertussis among adolescents aged 11-18 years

Measure: Annual rate of confirmed + probable cases, including outbreak settings, reported among adolescents aged 11-18 years.

Numerator: Count of all confirmed and probable cases of pertussis among adolescents aged 11-18 years.

Denominator: Age specific population estimates from the US Census.

Target setting method: 10% decrease

Other notes: NEDSS data are available for pertussis cases since 2001.

4c. Reduce varicella among persons aged 17 years of age and under

Measure: Annual rate of varicella cases reported among persons aged 17 years and under

Numerator: Count of persons aged 17 years and under reported to have had varicella in the past year

Denominator: Age specific population estimates from the US Census

Target setting method: 5% decrease

Other notes: Summary varicella aggregate reports were used for 2007-2010.

5. (Developmental) Reduce invasive healthcare-associated methicillin-resistant *Staphylococcus aureus* (MRSA) infections

Measure: Hospital-associated MRSA infections per 1000 patient days

Numerator: Number of MRSA-HAI in the hospital

Denominator: Number of patient days

Data Source: National Healthcare Safety Network (NHSN)

Target setting method: To be determined when data are available.

Other notes: Reporting of healthcare-associated MRSA infections has been mandated by the State and data will be analyzed when validated.

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